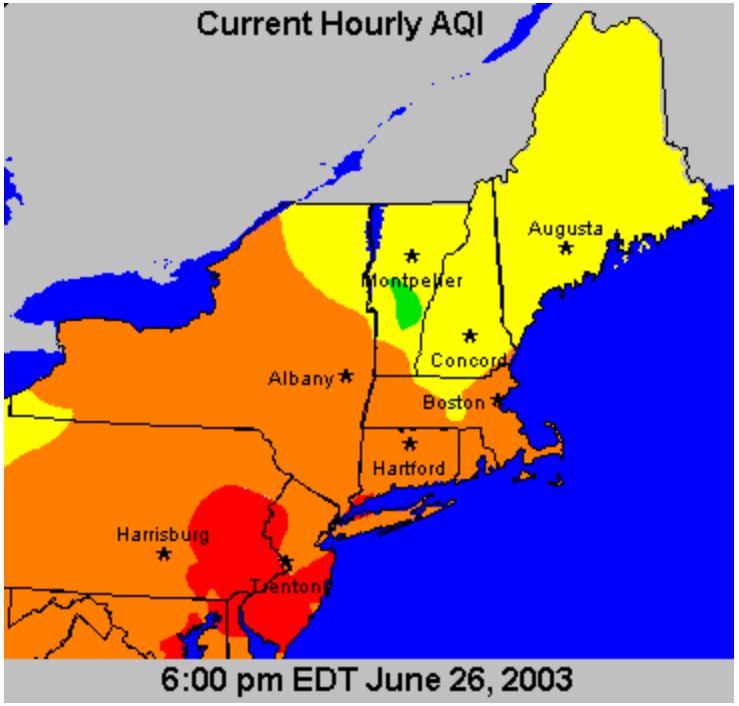
AQI Mapping

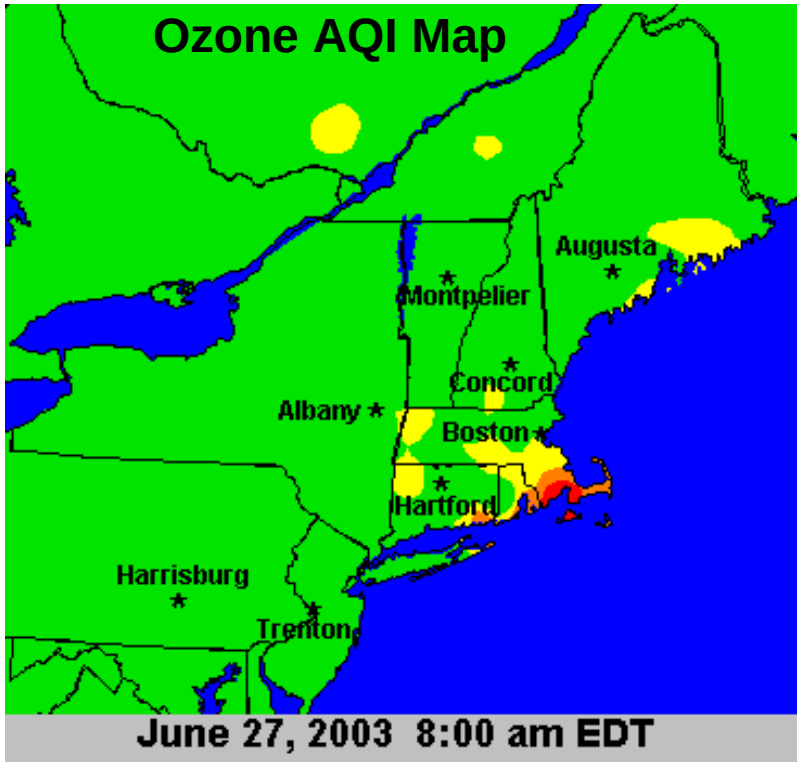


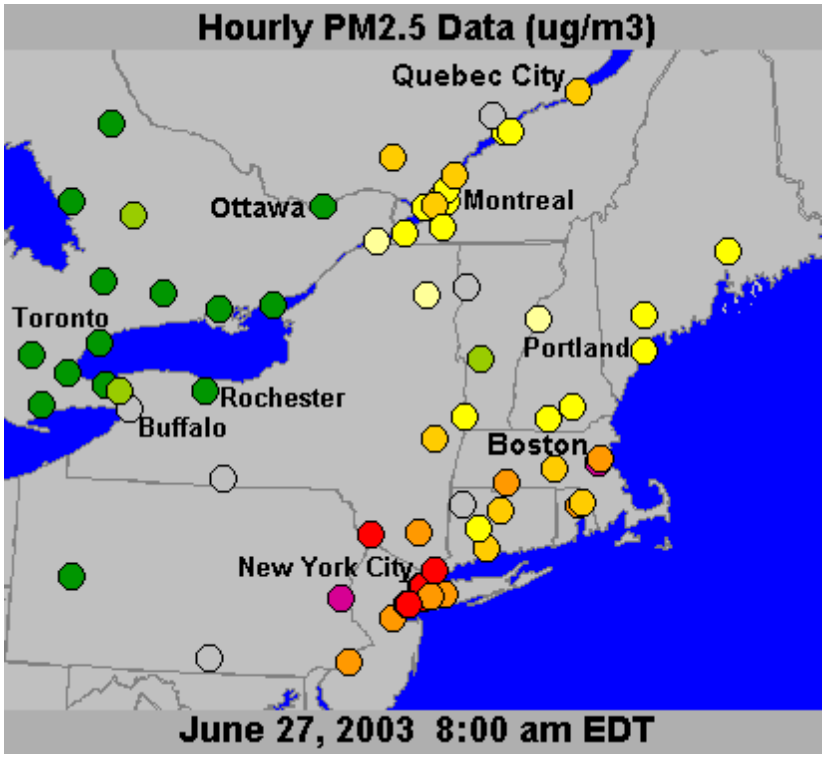
David Conroy
EPA Region 1
February 24, 2004

Current State of Affairs

- During the upcoming ozone season, separate maps will be created each hour for ozone and $PM_{2.5}$.
- Each of these maps displays the Air Quality Index for the respective pollutant.
- To get a true picture of the air quality in a given area, a person needs to look at and interpret both maps.
- Each day there may be times when the controlling AQI flips from one pollutant to another (and maybe back again).
- This is especially true on high ozone days, when the AQI for ozone will generally start off low and peak in the late afternoon.

On some days, just looking at the ozone map will be misleading





Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy

The ozone map indicates good air quality for the NYC metro area at 8 a.m. However, hourly $PM_{2.5}$ conc. were above 100 ug/m3 during this time.

1-hour Concentrations (µg/m³)
0-10
11-20
21-30
31-50
51-70
71-90
91-120
≥121
Data Not Available

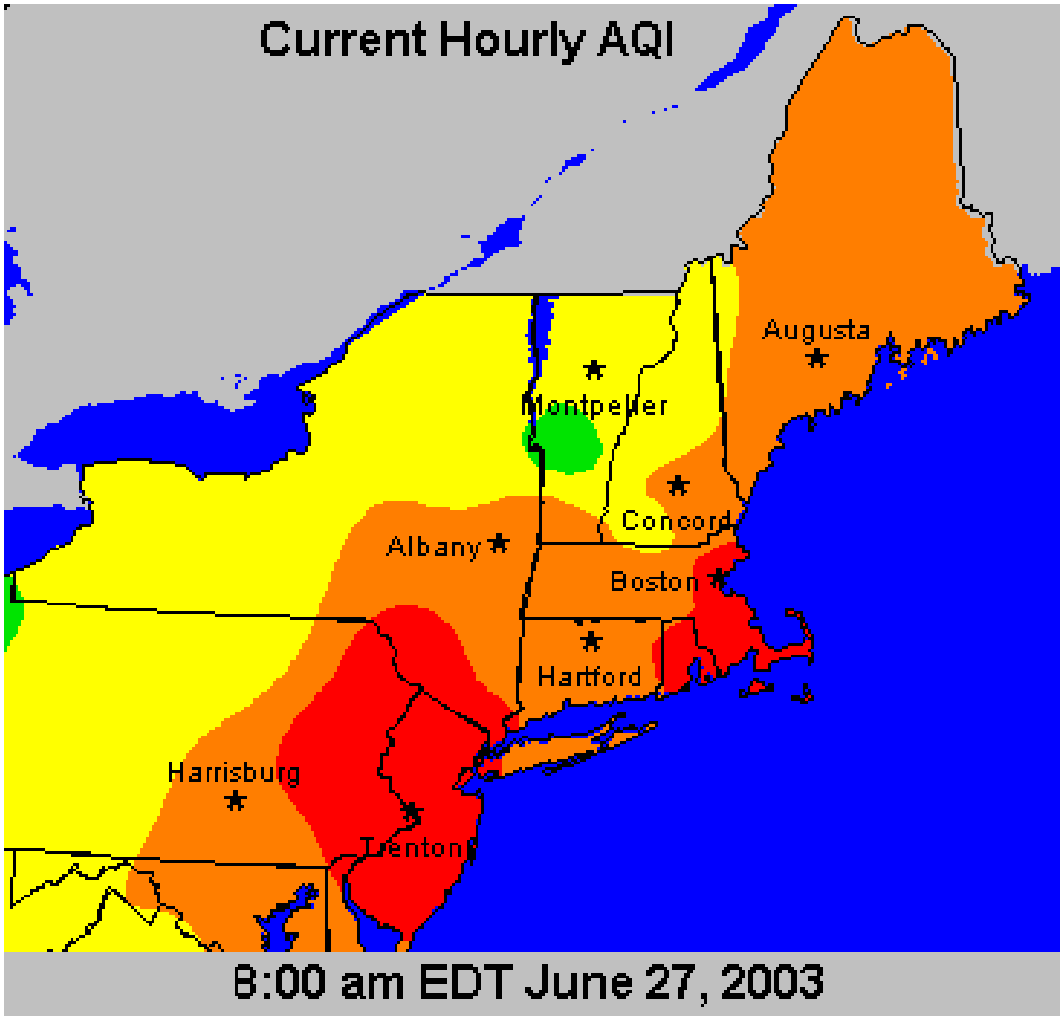
1-hour scale is arbitrary.
These are not AQI colors.

Does this look like good air quality?

Newark, NJ Hazecam on June 27, 2003 8:00 AM EDT

This is Good Air Quality

A more accurate tool for the public would be an hourly AQI map



Air Quality Index

- Good
- Moderate
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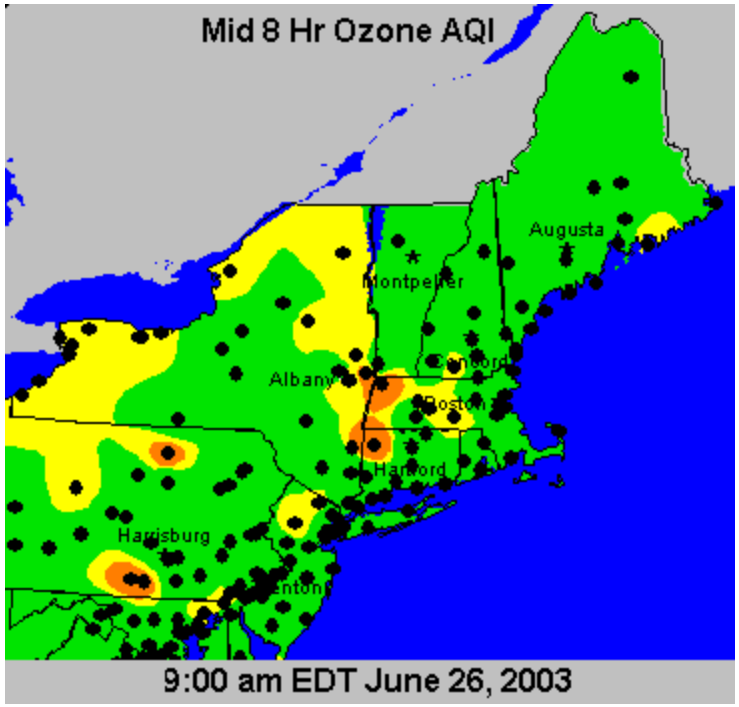
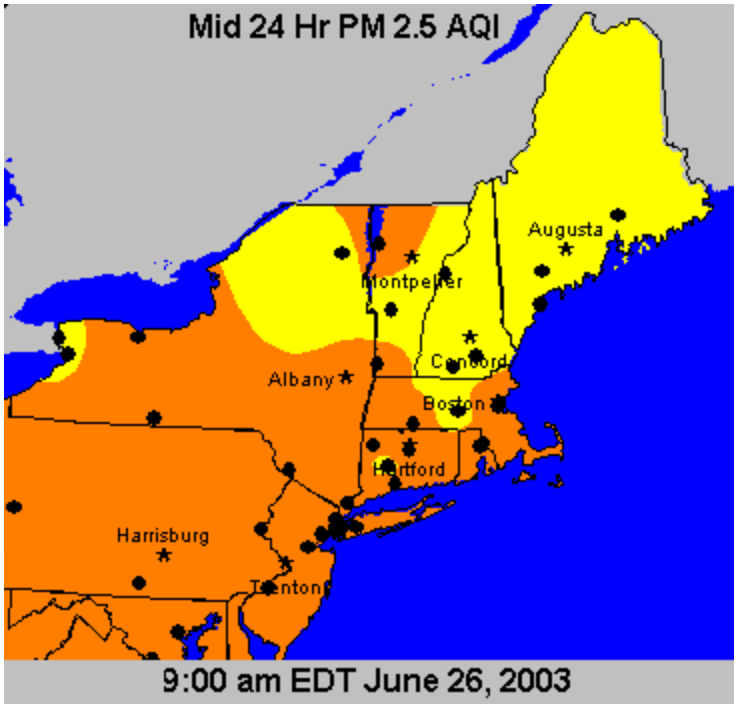
Can such maps be created?

- AIRNOW now collects hourly $PM_{2.5}$ and ozone data from most states, and produces current hour AQI maps for both pollutants.
- In areas with sufficient $PM_{2.5}$ monitoring densities, contour maps for $PM_{2.5}$ can be generated.
- For domains that have contour maps for both ozone and $PM_{2.5}$, a combined AQI map could be created.
- However, since there is not a $PM_{2.5}$ monitor at every ozone site, an AQI map cannot be made by simply using the highest value at each monitoring site.

How would such maps be created?

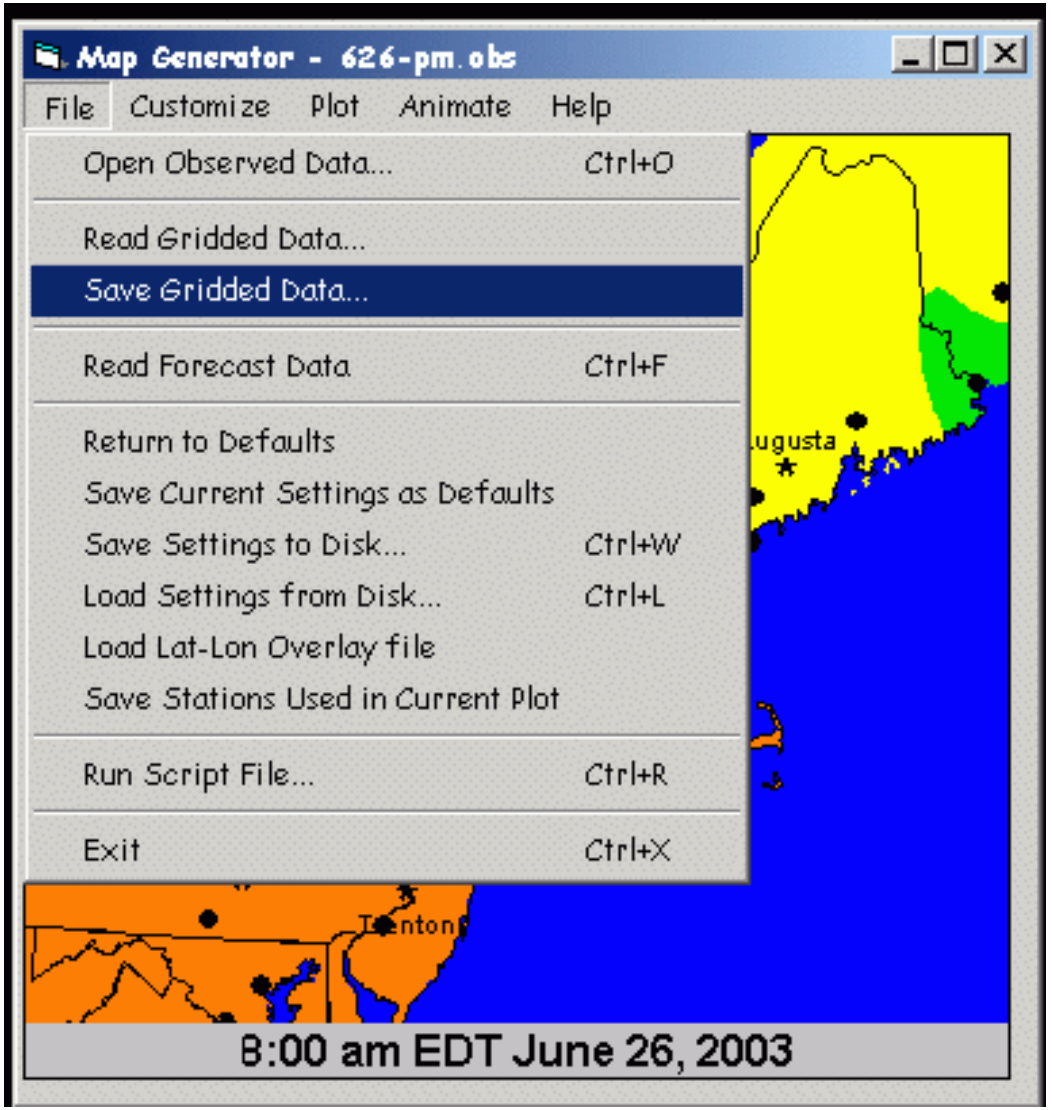
- The first step is to produce hourly AQI contour maps for both ozone and $PM_{2.5}$ for identical domains.
- Hourly AQI maps are generated using the appropriate surrogate method for each pollutant.



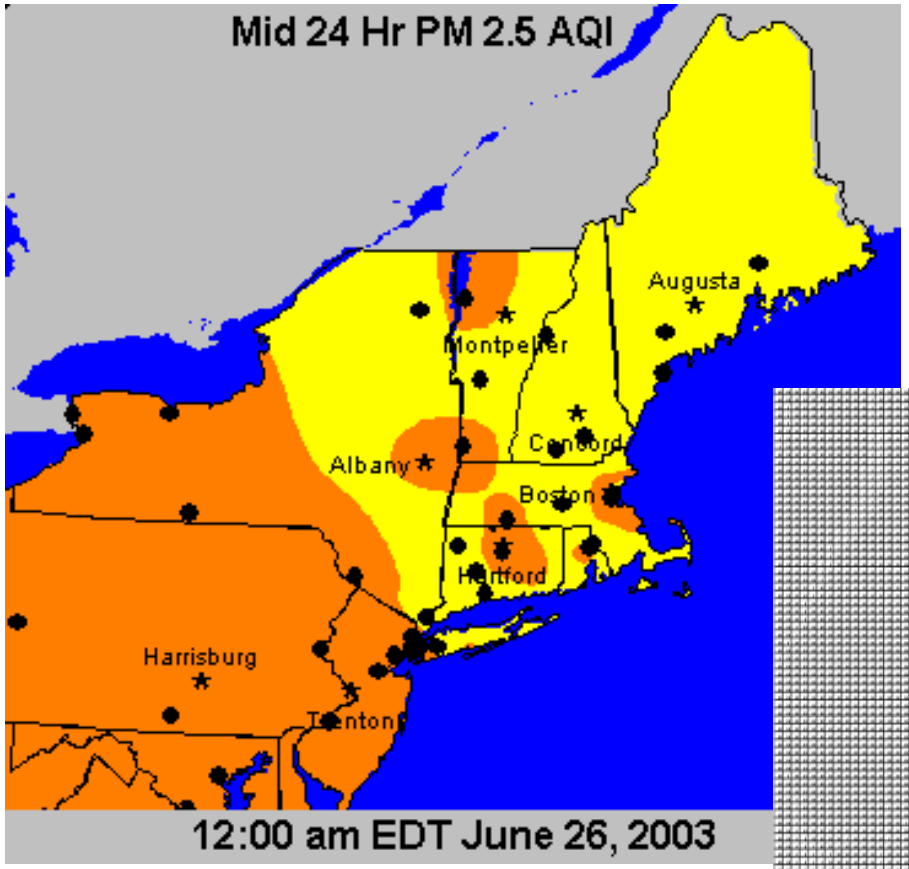


How would such maps be created?

- Next using MapGen, which is used to produce both the ozone and $PM_{2.5}$ maps, create hourly gridded AQI data for each pollutant.



What the Gridded Data Looks Like



- Each grid cell contains an AQI value

75	72	64	55
74	73	61	53
83	74	65	52

Example of a
100 x 100 grid

Using Gridded Data to Produce AQI Maps

- By maintaining a constant domain for both the ozone and $PM_{2.5}$ AQI map, matching grids can be created.
- With matching grids, a direct comparison of the data in each grid cell can be made.
- A simple logical function can be created which keeps the higher AQI value for each grid cell.
- The resulting merged gridded data can then be used to produce a “True AQI” map.

Gridded Ozone AQI data and $PM_{2.5}$ AQI data are compared to determine the higher AQI

Gridded Ozone AQI Data

71	63	45	39
68	65	48	40
69	52	46	39

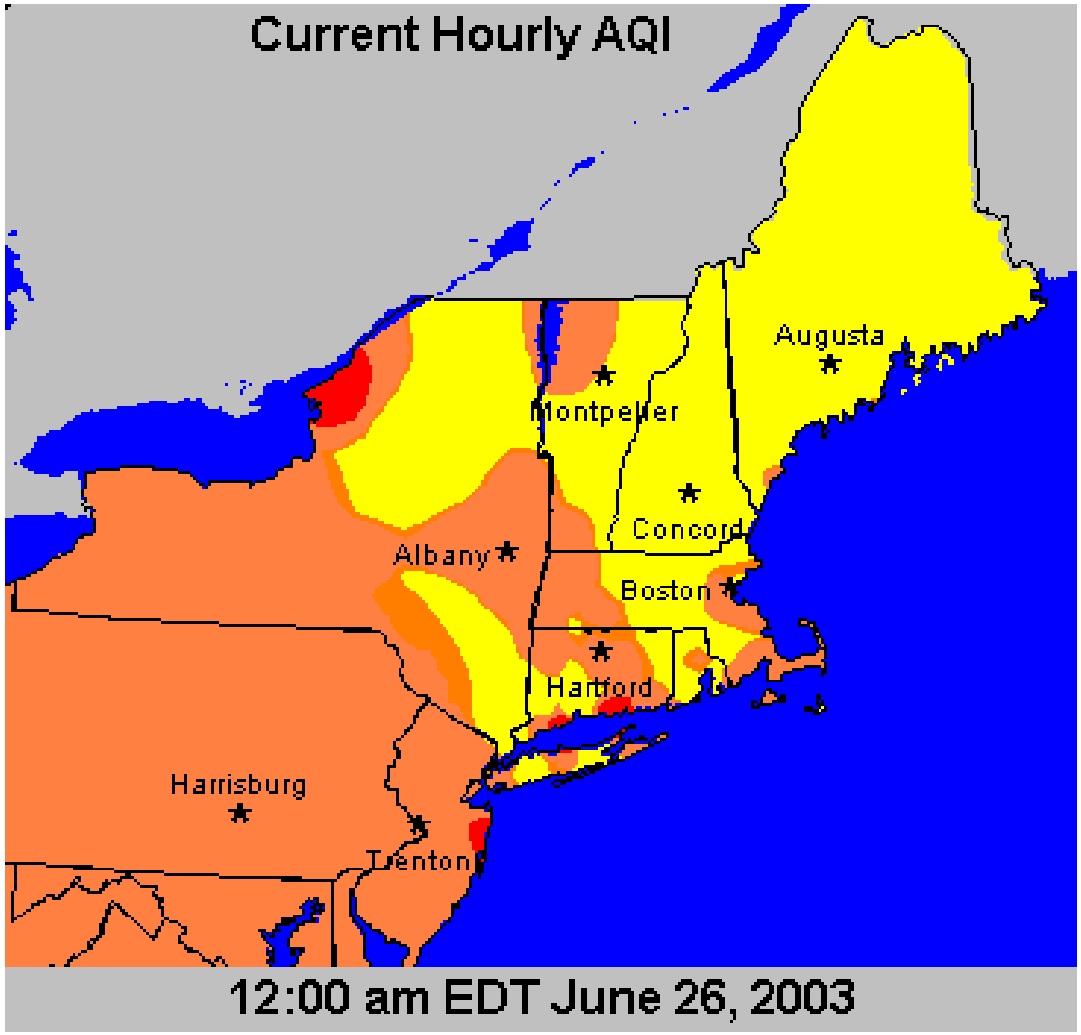
Gridded $PM_{2.5}$ AQI Data

120	70	63	21
71	85	55	51
48	35	37	29

Merged Gridded AQI Data

120	70	63	39
71	85	55	51
69	52	46	39

What results is a true AQI map



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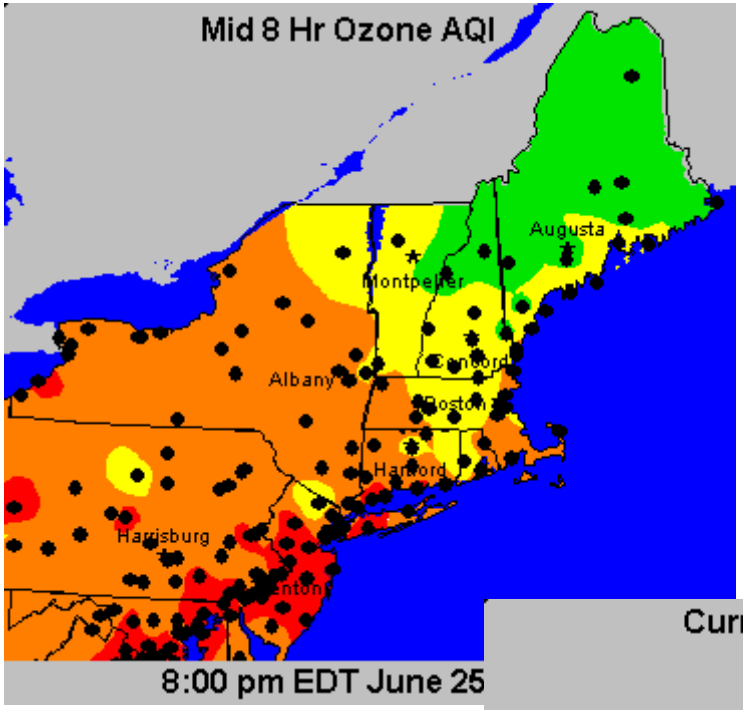
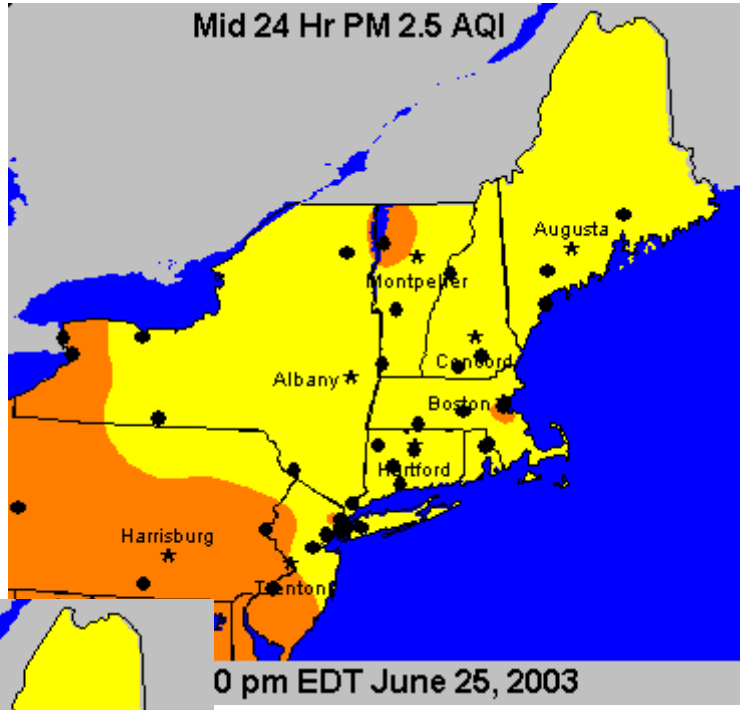
Benefits of a True AQI Map

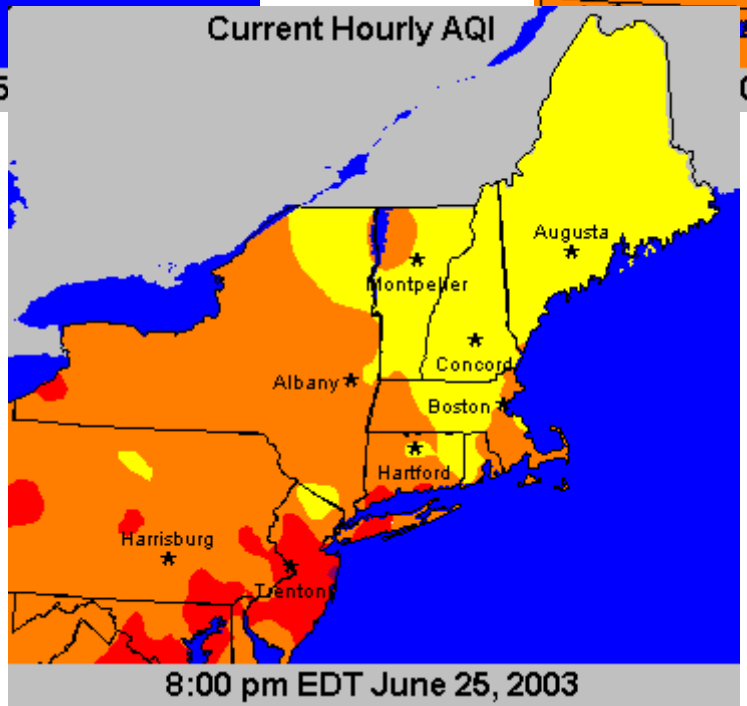
- With a true AQI map, the public has a more accurate picture of the current air quality conditions.

- Armed with such information, the public can make a more informed decision about behavior modifications they may need to make to protect themselves.

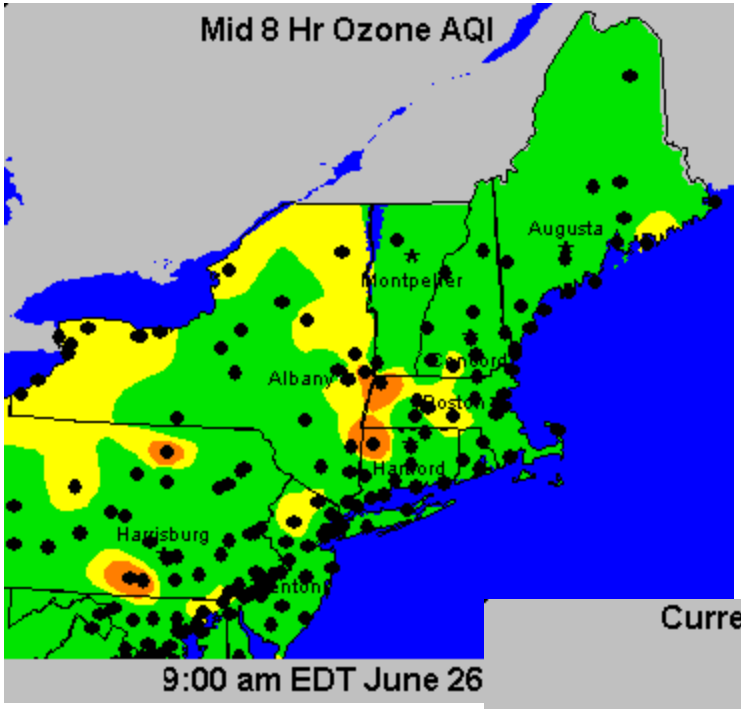
Early in this episode, ozone dominates throughout much of region

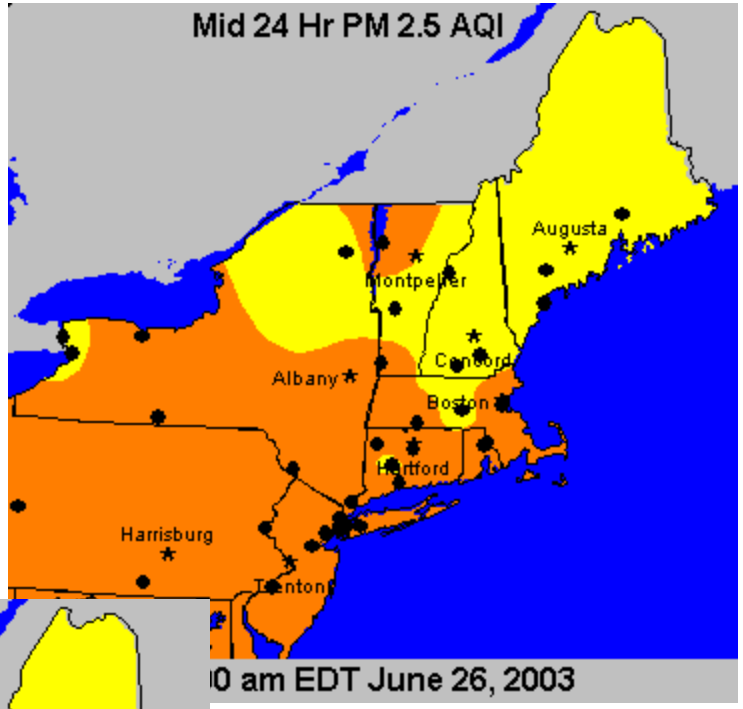


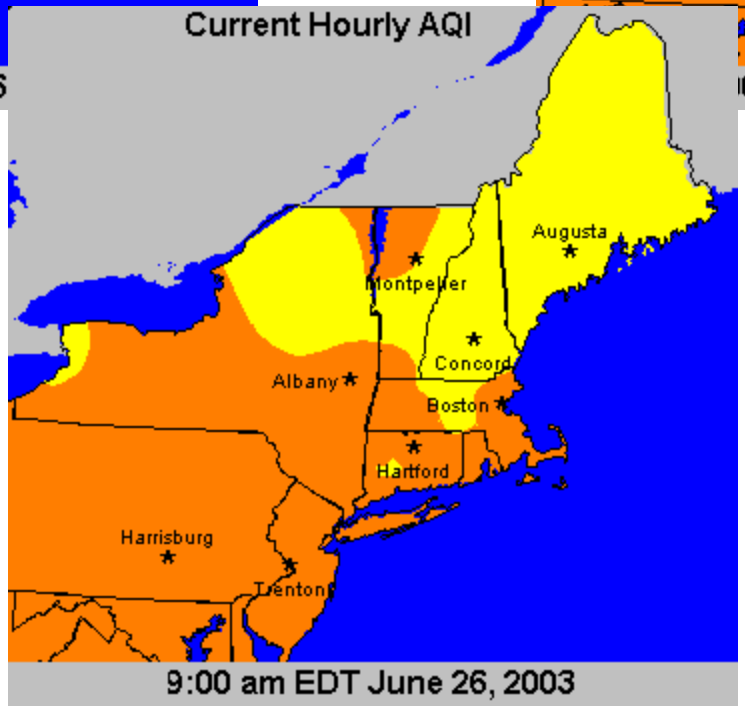




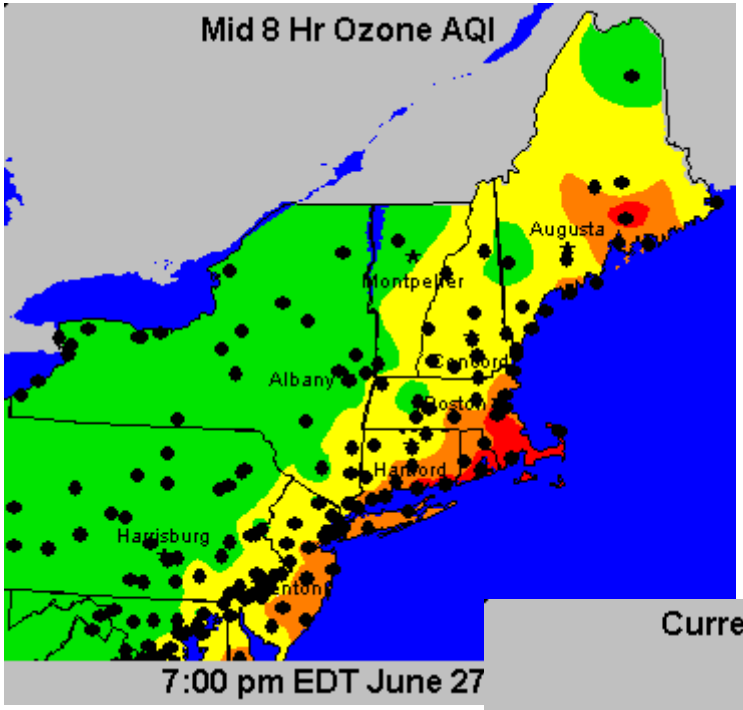
The next morning, PM2.5 dominants while ozone is still low

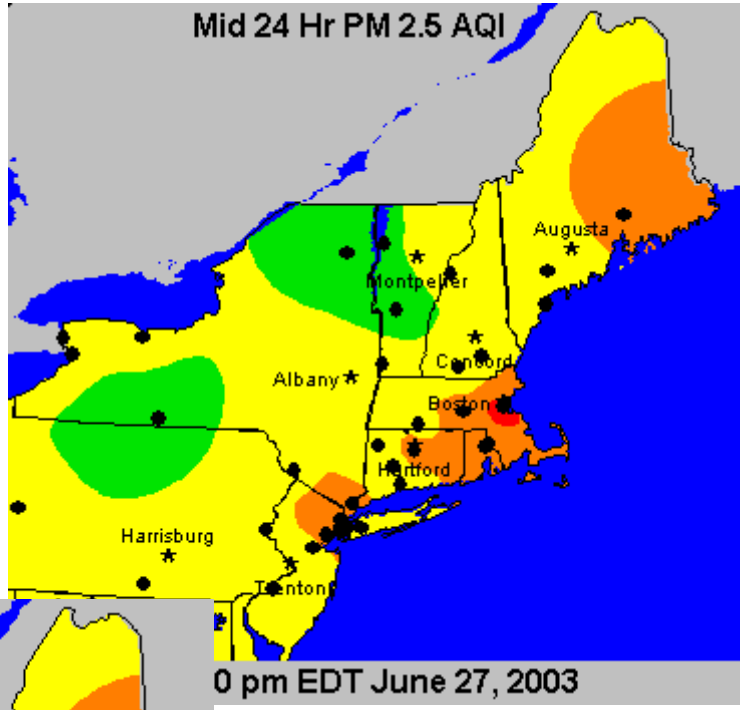


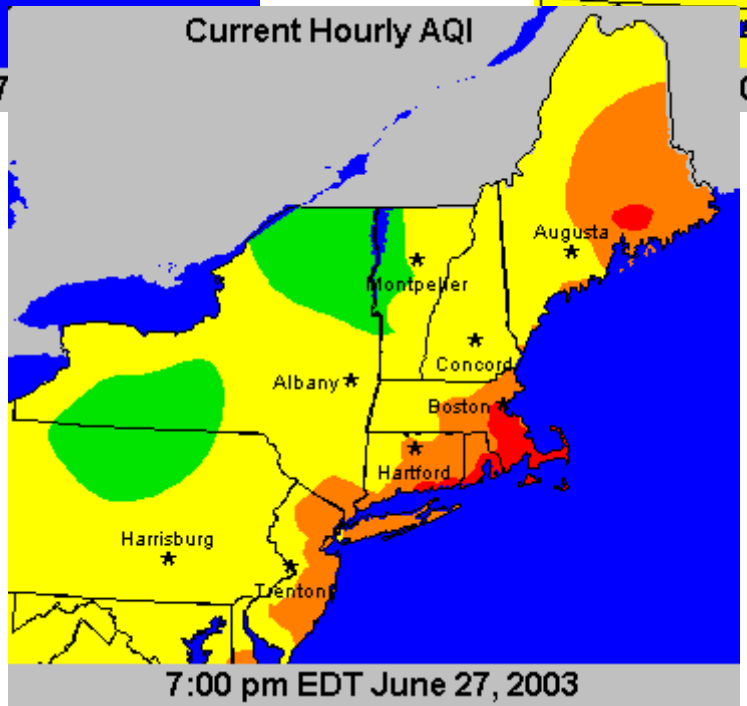




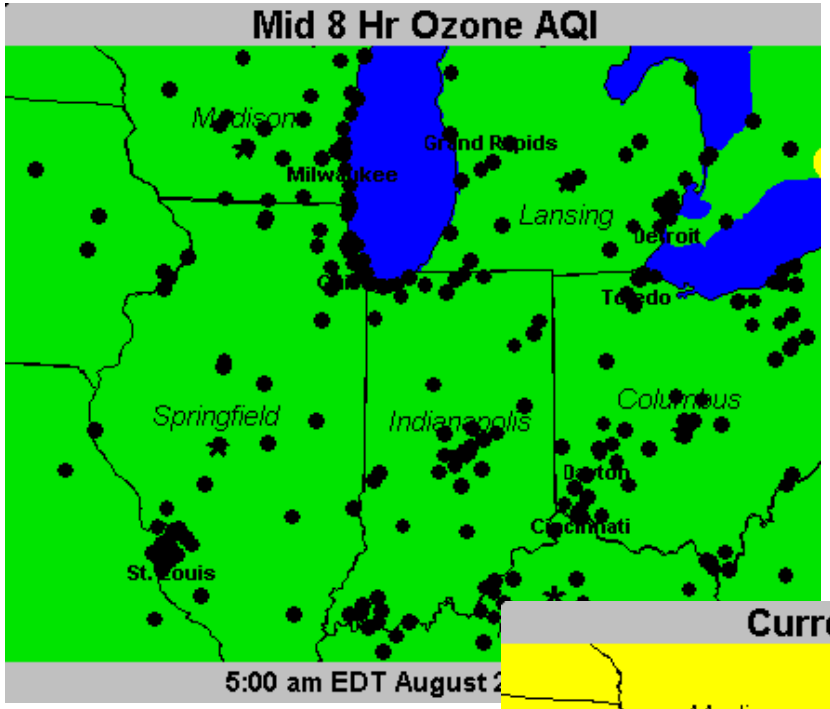
Late in episode, different pollutants dominate in different parts of a domain

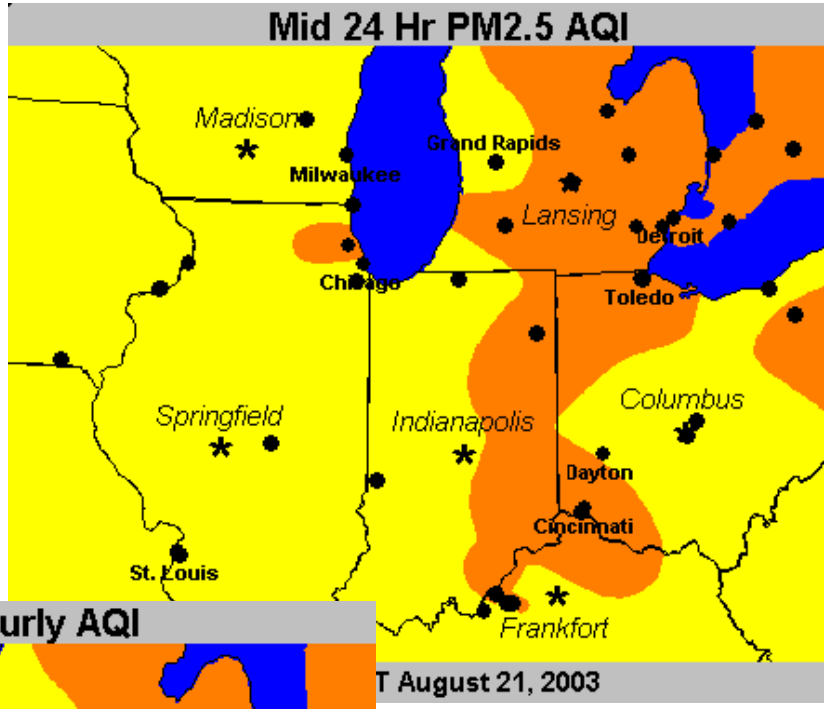


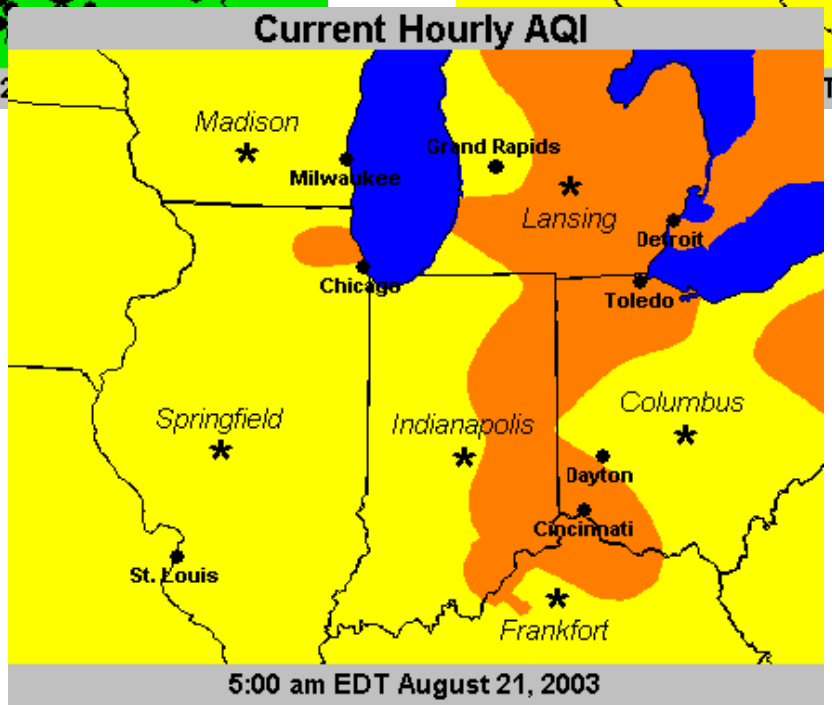




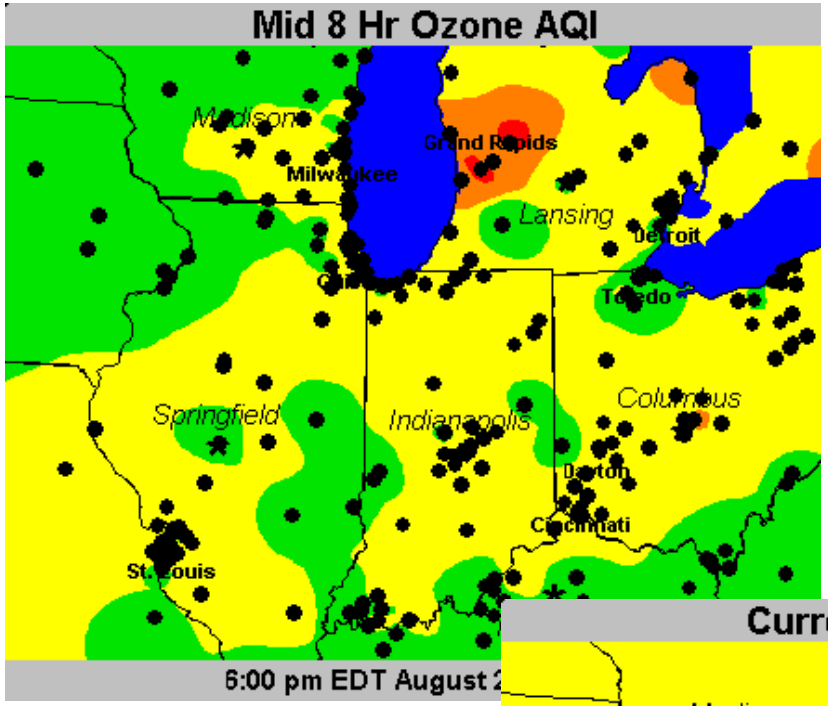
In this example, PM2.5 dominants in morning when ozone is still low

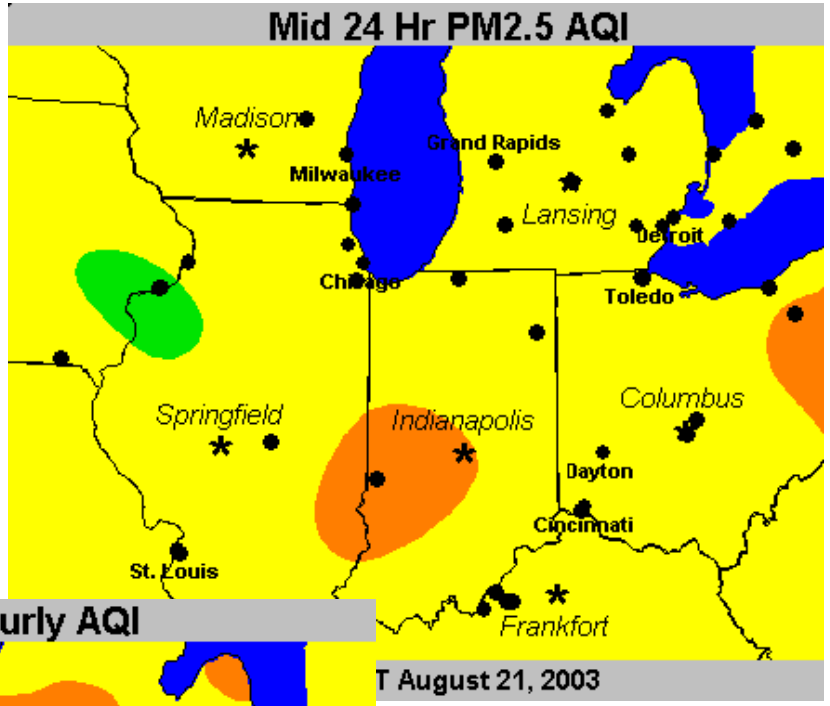


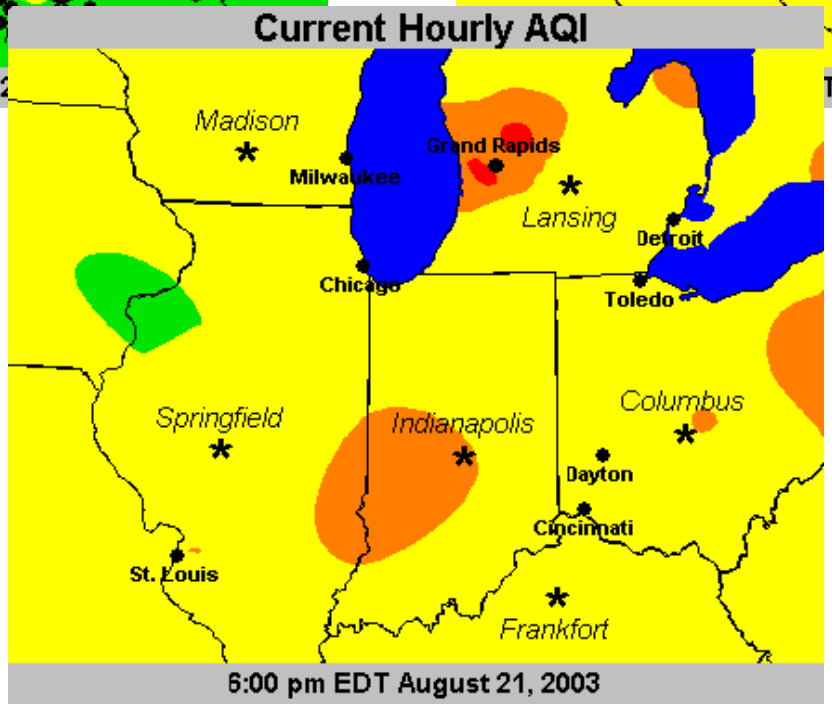




Later in afternoon, dominant pollutant differs depending on area







Conclusions

- True AQI maps can be generated for many of the domains on AIRNOW.
- In order to avoid confusing the public with maps for both ozone and $PM_{2.5}$, we should move as quickly as possible towards AQI maps where they can be accurately produced.
- This is especially critical during the summer months when the predominate pollutant can flip back and forth on many days.
- During the winter months in most areas, the $PM_{2.5}$ map is the AQI map.
- Areas with high AQI values for other pollutants (e.g., PM_{10}) can be dealt with on a case-by-case basis.